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*June 1998*

# *Mathematics 33*

## *Grade 12 Diploma Examination*

Alberta
EDUCATION

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*June 1998*

# *Mathematics 33*

## *Grade 12 Diploma Examination*

### *Description*

Time: 2.5 h. You may take an additional 0.5 h to complete the examination.

This is a **closed-book** examination consisting of

- 37 multiple-choice and 12 numerical-response questions of equal value, worth 70% of the examination
- 4 written-response questions, worth a total of 21 marks or 30% of the examination

Total possible marks: 70

This examination contains sets of related questions.

A set of questions may contain multiple-choice and/or numerical-response and/or written-response questions.

A mathematics data booklet is provided for your reference.

The perforated pages at the back of this booklet may be torn out and used for your rough work. No marks will be given for work done on the tear-out pages.

### *Instructions*

- Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.
- You are expected to provide your own scientific calculator.
- Use only an HB pencil to record your answer on the machine-scored answer sheet.
- If you wish to change an answer, erase **all** traces of your first answer.
- Do not fold the answer sheet.
- Now turn this page and read the detailed instructions for answering machine-scored and written-response questions.

## *Multiple Choice*

- Decide which of the choices **best** completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

***Example***

This examination is for the subject of

**A.** mathematics
**B.** chemistry
**C.** biology
**D.** physics

Answer Sheet

● Ⓑ Ⓒ Ⓓ

## *Numerical Response*

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.
- If an answer is a value between 0 and 1 (e.g., 0.25), then be sure to record the 0 before the decimal place.
- **Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.**

***Example 1***

The value of tan 35° to the nearest tenth is _____.
(Record your answer on the answer sheet.)

Calculator value: 0.7002075
Value to be recorded: 0.7

**Record 0.7 on the answer sheet** →

### *Example 2*

The constant term in the quadratic function $y = 2x^2 + 7x + 32$ is _____.
(Record your answer on the answer sheet.)

Value to be recorded: 32

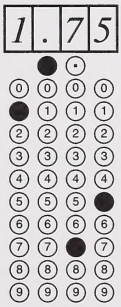
**Record 32 on the answer sheet** ⟶

### *Example 3*

If an annual interest rate of 7% is compounded quarterly, then the quarterly rate to the nearest hundredth of a percent is _____%.
(Record your answer on the answer sheet.)

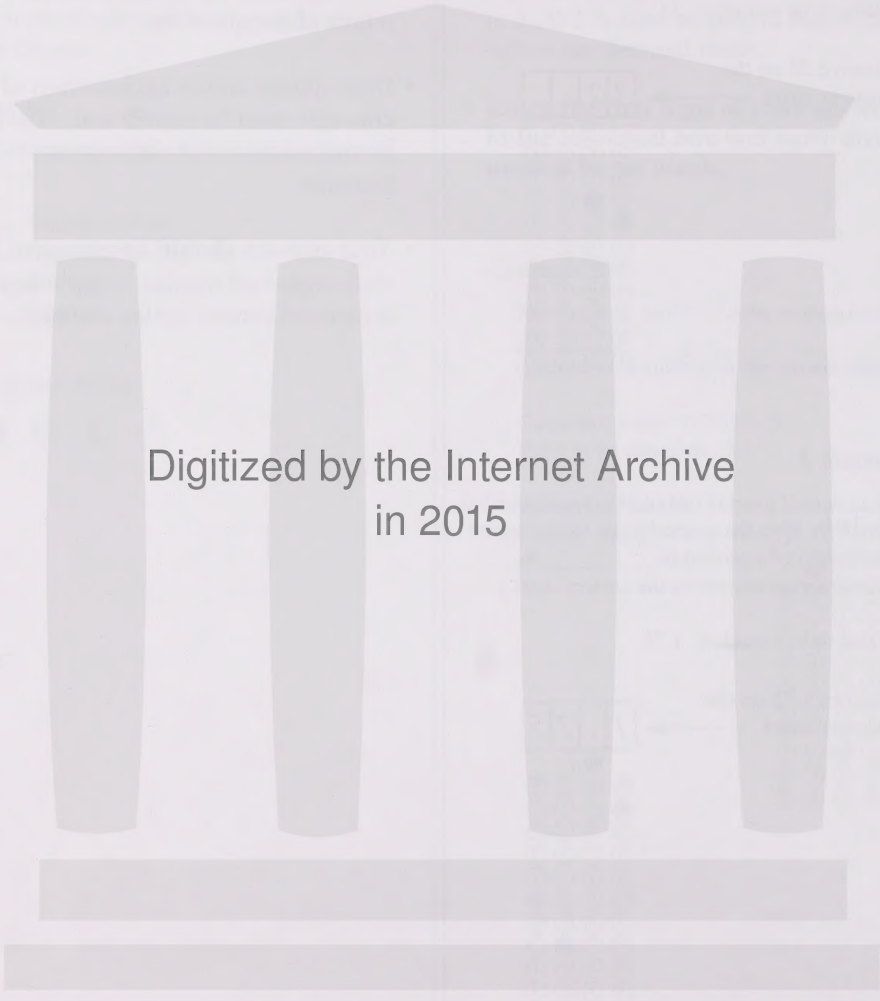
Value to be recorded: 1.75

**Record 1.75 on the answer sheet** ⟶




## *Written Response*

- Write your answers in the examination booklet as neatly as possible.
- For full marks, your answers must be well organized and address **all** the main points of the question.
- Descriptions and/or explanations of concepts must be correct and reflect pertinent ideas, calculations, and formulas.
- Your answers **should be** presented in a well-organized manner using complete sentences, correct syntax and units.



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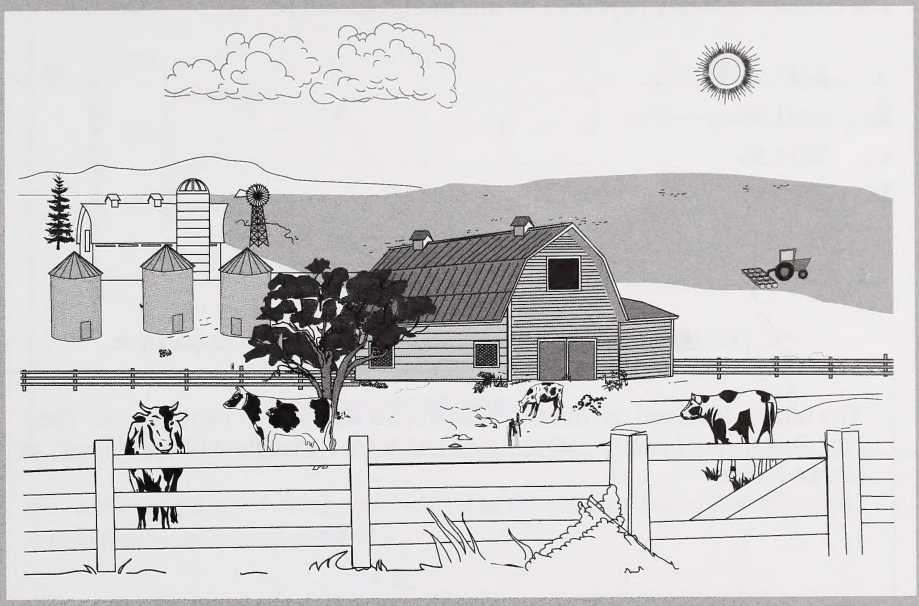
**AGRICULTURE**

People working in the farming industry apply mathematics in a variety of ways. The first set of questions will require you to apply your mathematical background to questions and problems related to a farm.



*Use the following information to answer the next question.*

A farmer obtained a 15-year mortgage of $45 000.00 to purchase some pasture land. The interest rate on the mortgage was 7% per annum.

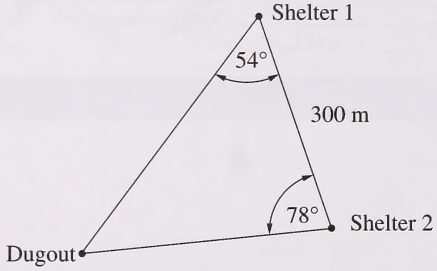
**1.** The farmer's monthly payments on this mortgage will be

**A.** $247.26
**B.** $401.96
**C.** $614.56
**D.** $787.85

---

*Use the following information to answer the next question.*

The farmer analyzed the distances between a dugout and two shelters. The two shelters are located 300 m apart and form a triangle with the dugout, as shown below.

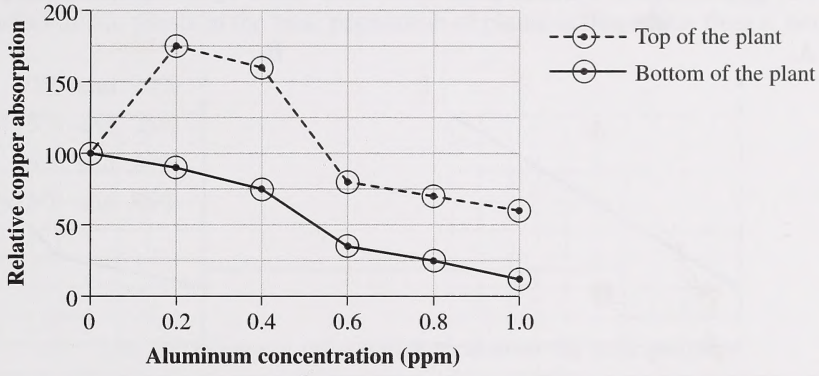



**2.** To the nearest metre, the distance between the dugout and the closer shelter is

**A.** 242 m
**B.** 293 m
**C.** 327 m
**D.** 395 m

*Use the following information to answer the next question.*

The farmer read a study of soil fertility and mineral absorption. It contained the graph below. The graph illustrates the relative absorption of copper by the top and bottom of a wheat plant when the plant was subjected to various solutions containing a fixed amount of copper but having different concentrations of aluminum.




**3.** From this graph, the farmer concluded that the relative absorption of copper **consistently** decreased at the

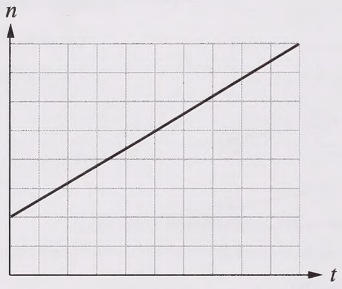
**A.** top of a wheat plant as the aluminum concentration increased
**B.** top of a wheat plant as the aluminum concentration decreased
**C.** bottom of a wheat plant as the aluminum concentration increased
**D.** bottom of a wheat plant as the aluminum concentration decreased

*Use the following information to answer the next question.*

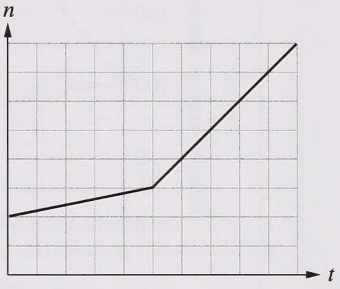
A strain of wheat bacteria grows exponentially, so that the number of cells $n$ doubles in every five hour time period $t$. An agricultural researcher developed a function and graph related to this bacterial growth.

**4.** The graph below that **best** represents this exponential growth is

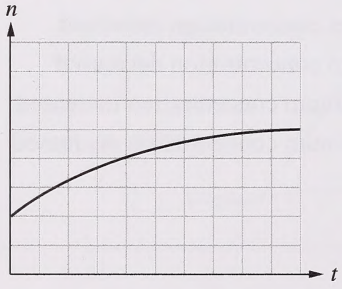
**A.**



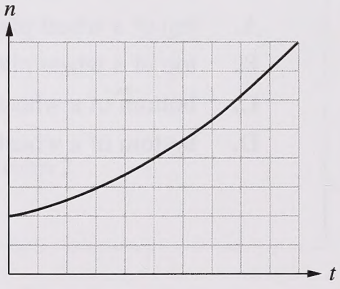

**B.**




**C.**




**D.**



*Use the following information to answer the next question.*

An agricultural researcher took a random sample of 100 plants from a wheat field. In the sample, the researcher found 80 wheat and 20 Canadian thistle plants.

**5.** Using this sample, the researcher can be 90% confident that the percentage of Canadian thistle plants in the total population of plants in this wheat field is between

**A.** 10% and 20%
**B.** 15% and 25%
**C.** 25% and 30%
**D.** 75% and 85%

---

*Use the following information to answer the next question.*

The researcher obtained four samples of plants from a barley field. The chart below indicates the number of weed plants in each of the four samples.

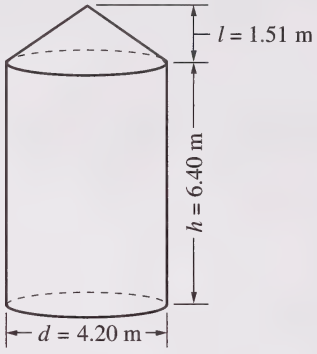
| Sample Number | Number of Weed Plants | Sample Size (Number of Plants) |
|---|---|---|
| 1 | 2 | 20 |
| 2 | 8 | 40 |
| 3 | 16 | 80 |
| 4 | 10 | 100 |

**6.** The sample size that would produce the **smallest** 90% confidence interval for the number of weed plants in the whole barley field is

**A.** 20
**B.** 40
**C.** 80
**D.** 100

*Use the following information to answer the next question.*

A manufacturer designed a granary, as shown below.




The manufacturer used the following radical equation and steps to determine the volume of the granary $V$ in cubic metres.

**Equation** $d = \sqrt{\dfrac{12V}{\pi(3h + l)}}$

**Step 1** $4.20 = \sqrt{\dfrac{12V}{\pi[3(6.40) + 1.51]}}$

**Step 2** $4.20 = \sqrt{\dfrac{12V}{\pi(20.71)}}$

**Step 3** $4.20 = \sqrt{\dfrac{3.82V}{20.71}}$

**Numerical Response**

**1.** The volume $V$, to the nearest tenth of a cubic metre, is _____ $m^3$.
(Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

The farmer required a loan of $6 370.00 in order to buy a grain auger. To work out a payment plan, the farmer set up the amortization spreadsheet shown below. The interest rate was 1% per month.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| **1** | **Month** | **Previous** | **Interest** | **Payment** | **New** |
| **2** | | **Balance** | **per month** | **Made** | **Balance** |
| **3** | 1 | $6 370.00 | $63.70 | $300.00 | $6 133.70 |
| **4** | 2 | $6 133.70 | $61.34 | $300.00 | $5 895.04 |
| **5** | 3 | $5 895.04 | $58.95 | $300.00 | $5 653.99 |
| **6** | 4 | $5 653.99 | $56.54 | $300.00 | $5 410.53 |

In a spreadsheet, information is located in "cells" designated by a letter and a number. For example, the value given in cell **C3** ($63.70) represents the amount of interest that accrued on the balance given in cell **B3** ($6 370.00). The value for cell **C3** was determined by the equation **C3** = 0.01 × **B3**.

**7.** The equation for the value given in the cell labelled **E4** is

**A.** E4 = B4 – D4
**B.** E4 = B4 + D4
**C.** E4 = B4 + C4 – D4
**D.** E4 = B4 – C4 + D4

*Use the following information to answer the next question.*

In order to finance the construction of an equipment building on his farm, the farmer considered borrowing $30 000 either through the loan option or the mortgage option shown below.

| | Loan Option | Mortgage Option |
|---|---|---|
| **Rate** | 9.25% per annum | 6.75% per annum |
| **Period** | 6 years | 15 years |

**Written Response — 5 marks**

**1.** • Using the appropriate tables, show how you calculate the regular monthly payment, to the nearest cent, for each option.

**i.** Loan option

**ii.** Mortgage option

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- Determine the total amount that would have to be repaid for each option.

- State one **advantage** and one **disadvantage** of choosing the mortgage option.

*Use the following information to answer the next question.*

For the sale of his grain, the farmer received \$40 000, which he invested in an annuity that had an interest rate of 8% per annum. From this investment, he received \$81 481.80 in 20 equal payments of \$4 074.09.

**8.** The \$40 000 that he invested is **best** described as the

**A.** present value of annuity interest
**B.** present value of an annuity
**C.** amount of an annuity
**D.** annuity payments

---

*Use the following information to answer the next question.*

The farmer decided to use one acre of land for a rectangular garden.
An acre is approximately $4\,047\ m^2$. The rectangular shape that the farmer used was $25\ m$ longer than it was wide.

**9.** If the width of the garden, in metres, is represented by $x$, then an equation that could be used to determine $x$ is

**A.** $x^2 + 25x = 0$
**B.** $25x^2 + 5x = 0$
**C.** $x^2 + 25x + 4\,047 = 0$
**D.** $x^2 + 25x - 4\,047 = 0$

*Use the following information to answer the next question.*

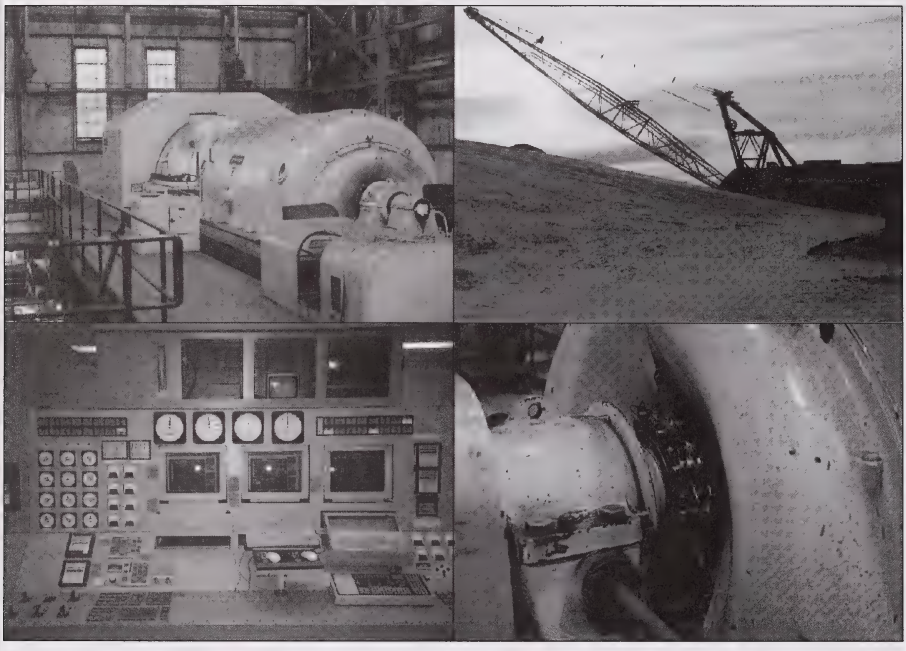
From his income, the farmer's hired employee invests $3 500 per annum in an annuity that will mature in 12 years. Interest on the annuity is compounded annually. The company offering the annuity guarantees a return of $62 587.48.

**10.** In order for this annuity to grow to $62 587.48, the annual rate of interest would be

**A.** 2%
**B.** 6%
**C.** 8%
**D.** 12%

## SCIENCE AND TECHNOLOGY

Training for industry in post-secondary institutions involves applying mathematics in the use of many mechanical and electronic devices. Use your mathematics background to solve the following problems related to science and technology.



*Use the following information to answer the next question.*

In a robotics lab, students collected data to analyze the relationship between the horizontal ($x$) and vertical ($y$) distances, in centimetres, that a particular object moved. They determined the relationship to be linear.

Some values for the linear relation are displayed in the table shown below.

| Horizontal distance ($x$) in centimetres | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Vertical distance ($y$) in centimetres | 5 | 7 | 9 | 11 | 13 | 15 | 17 |

**Numerical Response**

**2.** According to the relation shown, when the value of $x$ is 10 cm, the value of $y$ will be _____ cm.
(Record your answer on the answer sheet.)

---

*Use the following information to answer the next question.*

Students learned that the efficiency of a turbocharger (dynamic-type compressor) is a function of the difference between the air temperature before and after the air has been compressed. This efficiency can be calculated using the formula

$$E = \left( \frac{390 - I}{F - I} \right) \times 100,$$

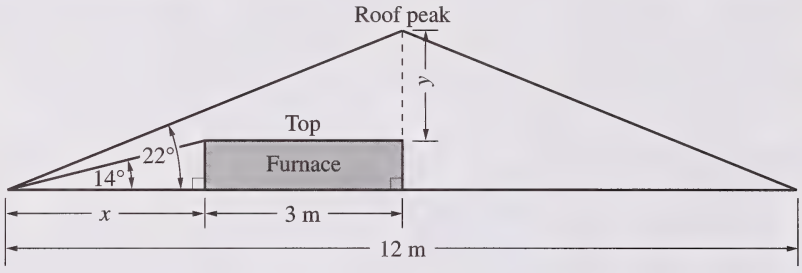
where $E$ is the efficiency of the compressor in percent, $I$ is the initial air temperature in Kelvin (K), and $F$ is the final air temperature in Kelvin (K).

**Numerical Response**

**3.** The efficiency $E$ of a turbocharger in which the initial air temperature is 295 K and the final air temperature is 415 K, to the nearest tenth of a percent, is _____ %.
(Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

Structural design students needed to determine the distance $x$ between a 3 m wide furnace and the farthest left point of a roof and the distance $y$ between the top of the furnace and the roof peak, as shown below. The cross-section of the roof forms an isosceles triangle whose sides form an angle of $22°$ with the horizontal and whose base measures 12 m.




**Written Response — 5 marks**

**2.** • Determine the distance $x$ between the furnace and the farthest left point of the roof.

• To the nearest tenth of a metre, determine the distance $y$ between the top of the furnace and the peak of the roof.

***You may also use the space provided on the next page to show your work.***

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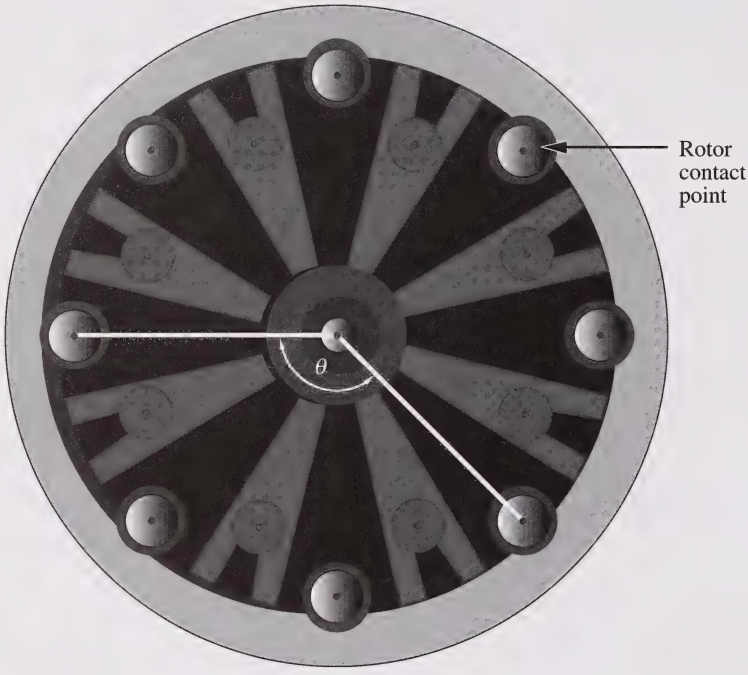
*Use the following information to answer the next question.*

An automotive technology student analyzed a circular distributor cap with 8 equally spaced rotor contact points, as shown below.

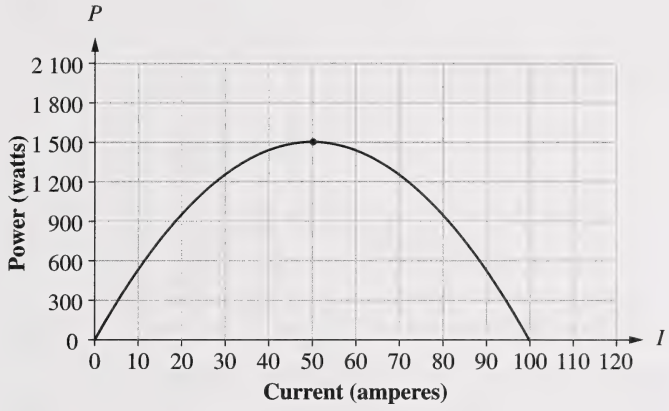



**11.** In this diagram, the measure of angle $\theta$ is

**A.** 45°
**B.** 135°
**C.** 150°
**D.** 225°

*Use the following information to answer the next question.*

In an electronics class, a student working on an electric generator noted that the power output $P$, in watts, is related to the current $I$, in amperes. This relationship is illustrated by the graph of a quadratic function shown below.




**12.** The quadratic function that could be used to describe the graph above is

**A.** $P = -0.6(I + 50)^2 - 1\,500$

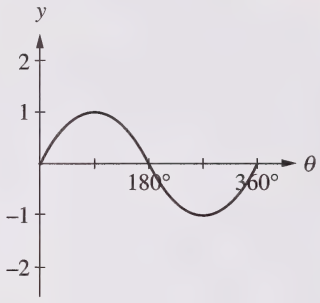
**B.** $P = -0.6(I + 50)^2 + 1\,500$

**C.** $P = -0.6(I - 50)^2 - 1\,500$

**D.** $P = -0.6(I - 50)^2 + 1\,500$

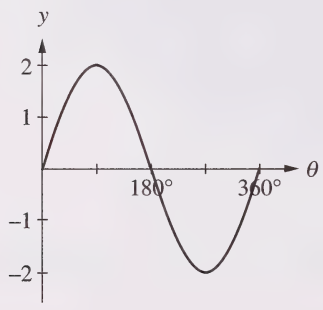
*Use the following information to answer the next question.*

The student also studied various voltage output patterns produced by another generator. The graph of a voltage pattern, represented by the equation $y = \sin \theta$, is shown below.

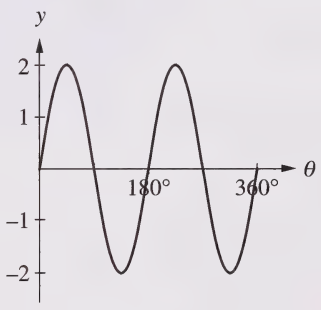



**13.** The graph of a different voltage pattern, represented by $y = 2 \sin \theta$, is

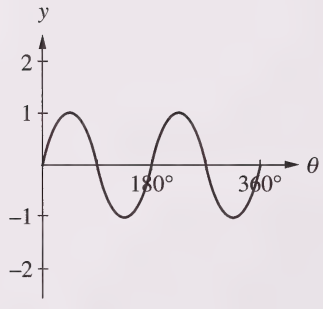
**A.**



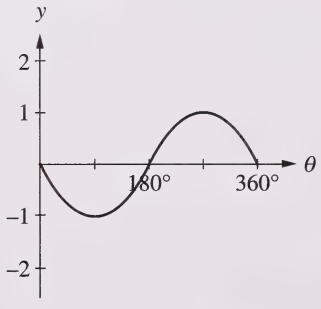

**B.**




**C.**

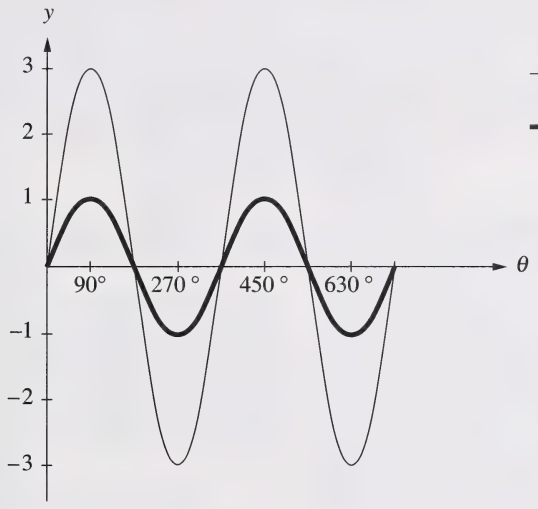



**D.**



*Use the following information to answer the next question.*

The student displayed the graphs of two trigonometric functions on a computer screen, as shown below.

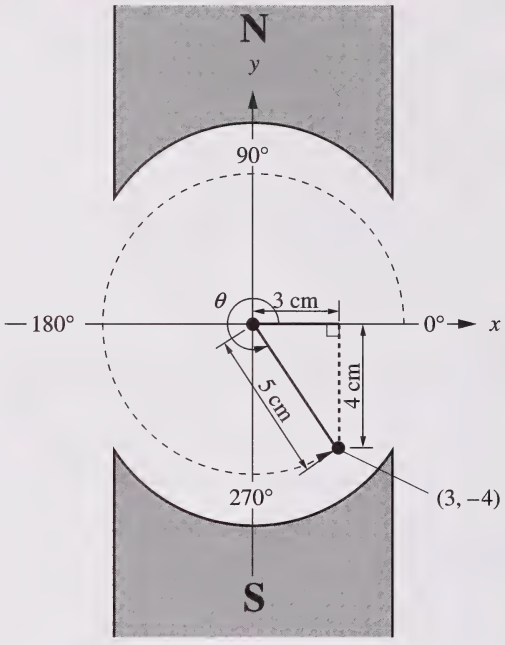



**14.** When the student compared graph $B$ with graph $A$, she correctly observed that the two graphs differ in their

**A.** ranges
**B.** domains
**C.** $y$-intercepts
**D.** $\theta$-intercepts

*Use the following information to answer the next question.*

Another student in the electronics class analyzed the graphical representation of a generator part rotated to a point $(3, -4)$ that is located at the terminal arm of an angle $\theta$. The lengths of the sides of the related right triangle are given below.




**15.** In this diagram, the exact value of $\cos\theta$ is

**A.** $-\frac{5}{4}$

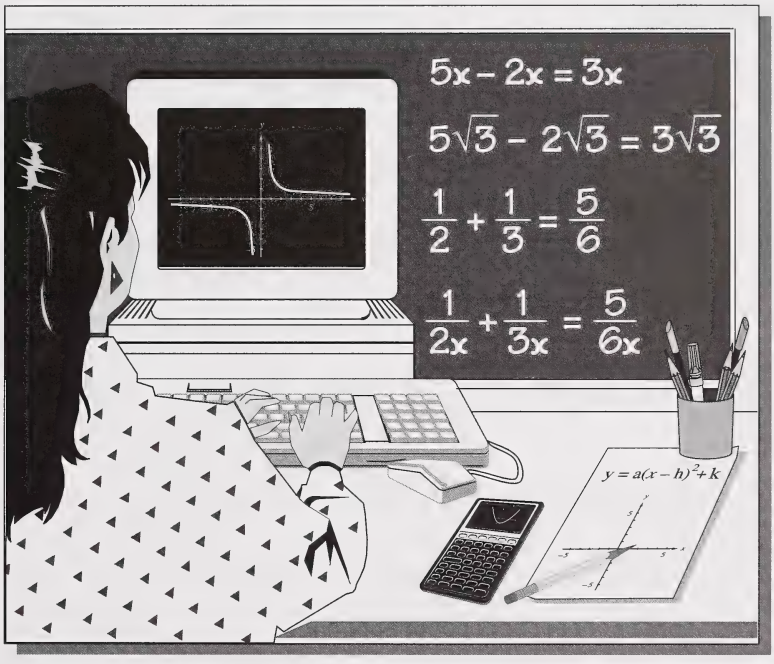
**B.** $-\frac{4}{5}$

**C.** $\frac{5}{3}$

**D.** $\frac{3}{5}$

**CONNECTIONS**

You can apply previously learned procedures that you used to do operations on fractions and polynomials to do operations on rational and radical expressions. As well, work done with expressions can be connected to equations and functions, which in turn, can be connected to graphical representations. The next set of questions are connected to these applications.



**16.** The non-permissible values of $x$ for the rational expression $\frac{3}{x-2}+\frac{5}{x^2-25}$ are

**A.** –2 and –25
**B.** 2 and 25
**C.** –2, 5, and –5
**D.** 2, 5, and –5

## Numerical Response

**4.** When the expression $\frac{x^2-4}{2x^2+19x+30}$, where $x \neq -\frac{15}{2}$ or –2, is simplified to the form $\frac{x-2}{ax+b}$, where $a$ and $b$ are whole numbers, the value of $b$ is _____ .

(Record your answer on the answer sheet.)

**17.** A simplified form of $\frac{3}{a^2-9} \div \frac{3a-6}{a-3}$, where $a \neq 2$, 3, or –3, is

**A.** $\frac{1}{(a+3)(a-2)}$
**B.** $\frac{1}{(a+3)(a-3)}$
**C.** $\frac{1}{(a-3)(a+2)}$
**D.** $\frac{9(a-2)}{(a-3)^2(a+3)}$

*Use the following information to answer the next question.*

When simplifying the rational expression $\frac{3}{x+1} - \frac{2}{x+2}$, where $x \neq -1$ or $-2$, a student wrote the following steps.

**Step I** $\frac{3(x+2)}{(x+1)(x+2)} - \frac{2(x+1)}{(x+1)(x+2)}$

**Step II** $\frac{3(x+2)-2(x+1)}{(x+1)(x+2)}$

**Step III** $\frac{3x+6-2x+2}{(x+1)(x+2)}$

**Step IV** $\frac{x+8}{(x+1)(x+2)}$

**18.** When the student analyzed her work, she saw that she had made an error in

**A.** step I
**B.** step II
**C.** step III
**D.** step IV

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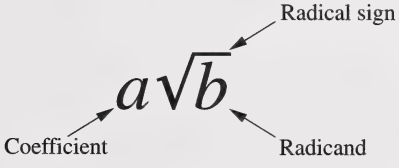
*Use the following information to answer the next question.*

A student used the illustration below to describe parts of a radical term.




**Numerical Response**

**5.** The student simplified $\sqrt{20} + \sqrt{125} + \sqrt{80}$ into a single expression, $a\sqrt{b}$, where $a$ and $b$ are whole numbers greater than 1. The value of the coefficient $a$ is _____.

(Record your answer on the answer sheet.)

**19.** When $\sqrt{3}\left(2\sqrt{a}\right)$, where $a > 0$, is simplified, the resulting expression is

**A.** $2\sqrt{3a}$

**B.** $2\sqrt{3+a}$

**C.** $6\sqrt{a}$

**D.** $6\sqrt{3a}$

**20.** The product of $\left(2\sqrt{7}-4\sqrt{x}\right)\left(\sqrt{7}+2\sqrt{x}\right)$, where $x > 0$, is

**A.** $14 - 8x$

**B.** $14 + 8x$

**C.** $-10 + \sqrt{x}$

**D.** $2\sqrt{7} - 8\sqrt{x}$

**21.** An equivalent form of $\dfrac{\sqrt{6}-a}{4\sqrt{2}}$ is

**A.** $\dfrac{\sqrt{3}-a}{4}$

**B.** $\dfrac{2\sqrt{3}-a\sqrt{2}}{4}$

**C.** $\dfrac{2\sqrt{3}-a\sqrt{2}}{8}$

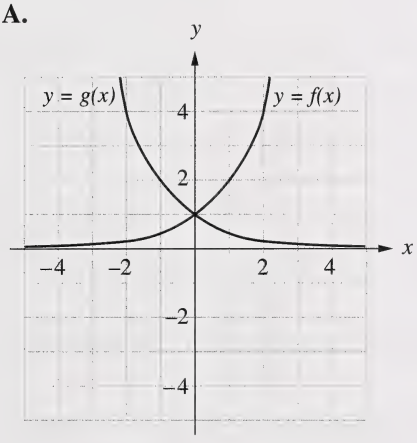
**D.** $\dfrac{8\sqrt{3}-4a\sqrt{2}}{8}$

## Numerical Response

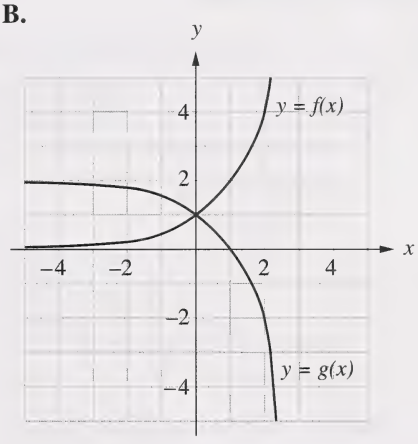
**6.** The solution to the equation $\sqrt{5w} + 3 = 12$, to the nearest tenth, is $w =$ _____ .
(Record your answer on the answer sheet.)

**22.** The function $g(x)$ is the inverse of the function $f(x)$. The set of graphs that represents the inverse relationship of $f(x)$ and $g(x)$ is

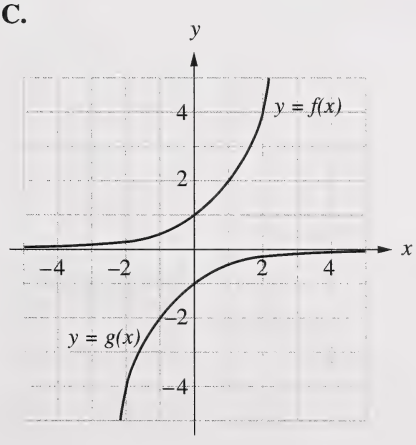
**A.**



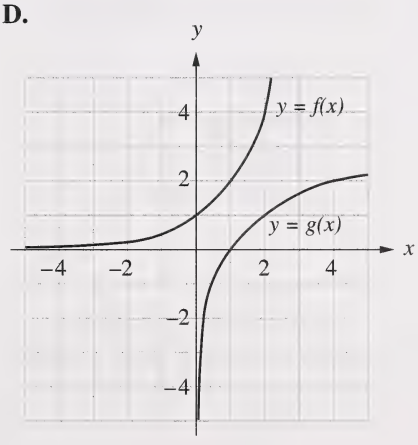

**B.**




**C.**




**D.**



*Use the following information to answer the next question.*

The graph of a function $y = g(x)$ is transformed by

- reflecting it across the $x$-axis
- shifting it 29.4 units to the right
- shifting it 14.7 units upward
- stretching it vertically by a factor of 2.0

**Numerical Response**

**7.** If the final function representing this graph is written in the form $y = a \bullet g(x - h) + k$, then the value of $h$, to the nearest tenth, is _____ .
(Record your answer on the answer sheet.)

---

*Use the following information to answer the next question.*

The graph of $y = a(x - 2)^2 + 3$, where $a > 0$, is displayed on a graphing calculator.

**23.** If the value of $a$ is replaced by $\frac{a}{2}$, then the graph

**A.** shifts upward
**B.** becomes wider
**C.** shifts downward
**D.** becomes narrower

*Use the following information to answer the next question.*

A student "completed the square" by changing the quadratic function $y = 2x^2 - 12x - 8$ into the form $y = a(x - h)^2 + k$. The first three steps of the student's work are shown below.

**Step 1** $y = 2x^2 - 12x - 8$

**Step 2** $y = 2(x^2 - 6x + __) - 8$

**Step 3** $y = 2(x^2 - 6x + P) - 8 - 2P$

**24.** The correct value for $P$ in step 3 of the student's work is

**A.** –18
**B.** –9
**C.** 9
**D.** 18

---

**25.** The graph of the quadratic function $f(x) = -(x + 3)^2 + k$ has its axis of symmetry given by the equation

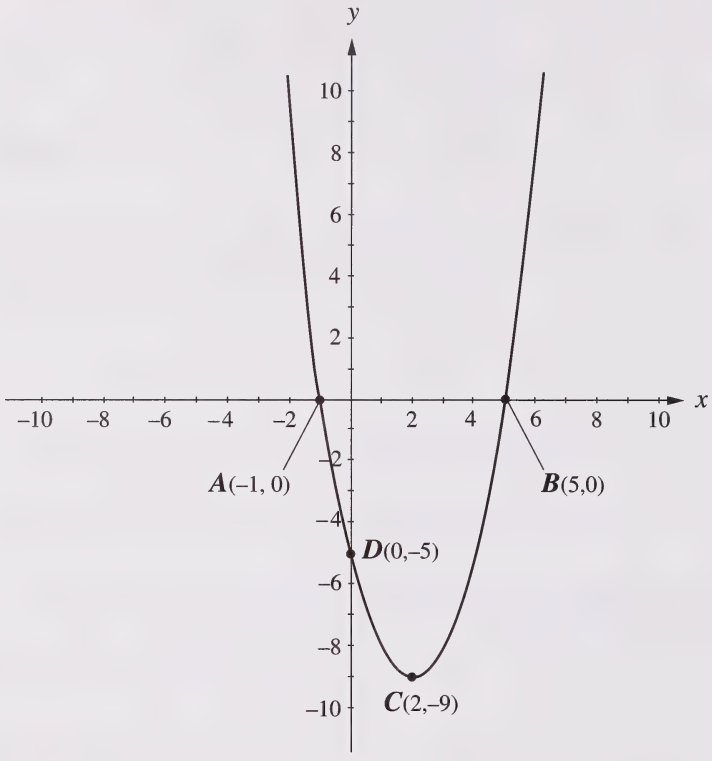
**A.** $x = -3$
**B.** $x = 3$
**C.** $x = -k$
**D.** $x = k$

## Numerical Response

**8.** For the function $f(x) = 2x^2 + 4x + 10.5$, the value of $f(5)$, to the nearest tenth, is _____ .
(Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

A graphics design student sketched the graph of a quadratic function and labelled the points, as shown below.




The student knew that because $a = 1$, the quadratic function could be written in any of the following forms:

$$y = x^2 + bx + c$$
$$y = (x - p)(x - q)$$
$$y = (x - h)^2 + k$$

**Written Response — 6 marks**

**3.** • Identify an $x$-intercept of the graph.

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- If the graph is represented by the equation of the form $y = (x - h)^2 + k$, then what is the value of $k$? Provide justification for the value chosen.

- Use one or two of the points given on the graph to write an equation that corresponds to the graph. Clearly explain which point or points you used and how you used them.

- Express your final equation in the form $y = x^2 + bx + c$.

*Use the following information to answer the next question.*

A student transformed the graph of a function defined by $y = 2x^2$ so that the parabola's vertex was relocated at the point $(-1, 3)$.

**26.** An equation of a parabola with a vertex at $(-1, 3)$ is

**A.** $y = 2(x - 1)^2 + 3$
**B.** $y = 2(x + 1)^2 + 3$
**C.** $y + 3 = 2(x + 1)^2$
**D.** $y + 3 = 2(x - 1)^2$

---

## Numerical Response

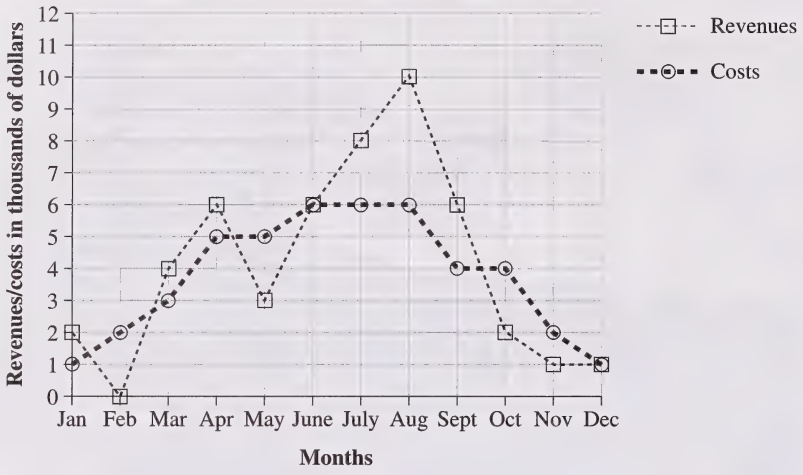
**9.** A student used a quadratic formula to correctly solve the equation $5x^2 + 4x - 6 = 0$. The value of $b^2 - 4ac$ that he used was _____ .
(Record your answer on the answer sheet.)

**SPORTS AND RECREATION**

In the sport of golf, mathematics can be used to analyze, predict, and plan finances, operations and equipment needs. Apply your mathematical understanding to the situations presented in the next set of questions.

*Use the following information to answer the next question.*

The pro shop at a golf course may experience profits and losses. When revenues are greater than costs, a profit occurs. When costs are greater than revenues, a loss occurs. If revenues are greater than costs over the year, the pro shop can stay in operation. The graph below shows the revenues and costs for the pro shop for each month during the past year.




**Written Response — 5 marks**

**4.** **a.** Identify two months in the year when the pro shop experienced a loss. Support your answer with data from the graph.

**b.** When costs are equal to revenues, a business is said to "break even." Identify two months in the year in which the pro shop "broke even."

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**c.** Describe what happened from June to December inclusive in terms of profit and loss.

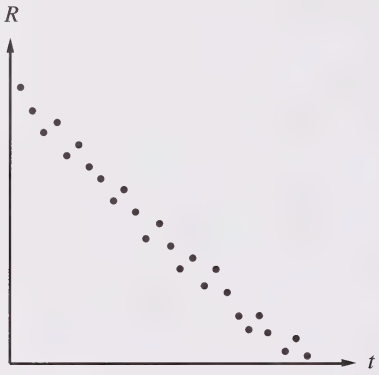
**d.** Justify whether or not this pro shop will be able to stay in operation.

*Use the following information to answer the next question.*

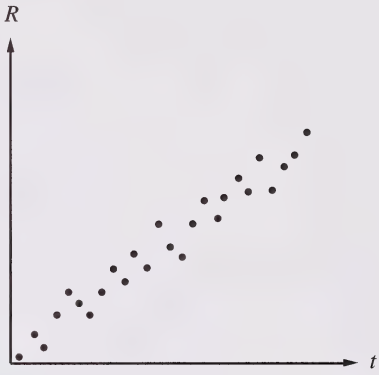
Management at the pro shop reviewed a scatter plot that related revenues ($R$) to two-week time periods ($t$) over one year. The scatter plot approximated the same shape as the graph of a quadratic function.

**27.** The graph they likely reviewed was

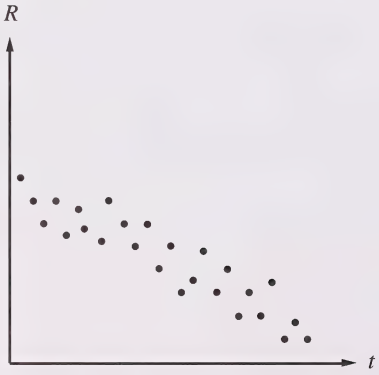
**A.**



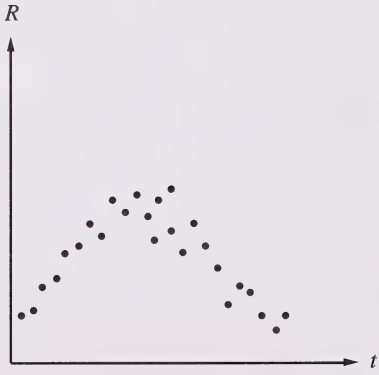

**B.**




**C.**




**D.**



*Use the following information to answer the next question.*

A golf club wished to find out whether the amount of money spent by golfers is related to the age of the golfers. After the marketing staff collected bivariate data, they made inferences about the possible relationship.

**28.** Bivariate data can **best** be described as data

**A.** collected from yes/no surveys
**B.** collected from biased samples
**C.** involving observations on two variables
**D.** involving observations on a single variable

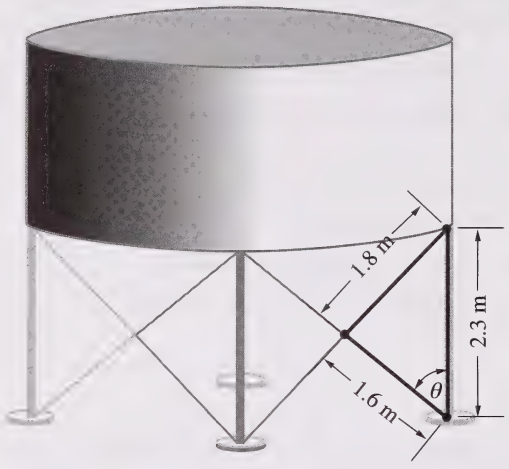
---

**29.** Past studies have determined that 45% of all golfers in Alberta are women. To verify these findings, a golf club conducted a survey of 20 randomly selected Alberta golfers. Assuming a 90% confidence interval for the number of women, which of the following samples is **unlikely** for the population of golfers in Alberta?

**A.** 6 women, 14 men
**B.** 8 women, 12 men
**C.** 10 women, 10 men
**D.** 15 women, 5 men

*Use the following information to answer the next question.*

The structure shown below is an overhead water storage tank at a golf course.




**30.** The measure of angle $\theta$, formed between the 2.3 m support leg and the 1.6 m portion of a diagonal brace, correct to the nearest degree, is

**A.** 46°
**B.** 48°
**C.** 51°
**D.** 63°

---

*Use the following information to answer the next question.*

A circular engine part on a golf cart was out of rotational alignment and needed repair. The repair person needed to turn the part –96° to reset its alignment.

**Numerical Response**

**10.** The positive co-terminal angle for –96° that is between 0° and 360° is _____ °.
(Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

A golf instructor invested part of her earnings in an annuity at the beginning of each month. She invested $50.00 each month for three years in an annuity plan that earned 12% per annum compounded monthly.

**Numerical Response**

**11.** The amount of the annuity after 3 years, to the nearest dollar, was $_____ .
(Record your answer on the answer sheet.)

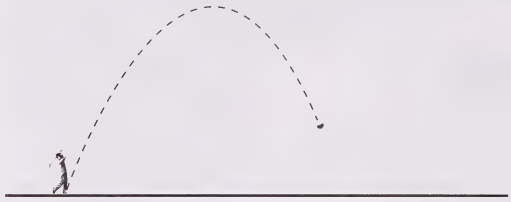
---

**31.** On a scatter plot, a researcher plotted the relationship between the number of golfing lessons taken by a golfer and the number of strokes used by the same golfer to complete a round of golf. From the scatter plot, the researcher determined that as the number of golf lessons taken by a golfer increased, the number of strokes used by that golfer to complete a round decreased. The correlation described by the researcher is

**A.** negative
**B.** positive
**C.** inverse
**D.** non-apparent

*Use the following information to answer the next two questions.*

A golf ball is hit so that it travels on a parabolic path. A golf analyst used a video record to determine the height of a ball as a function of time.



The golf analyst determined that the quadratic function

$$h(t) = -5(t-2)^2 + 20,$$

where $h(t)$ is the height of the golf ball in metres above the ground and $t$ is the time in seconds, summarizes the video record.

**32.** From ground level, the maximum height that the golf ball will reach is

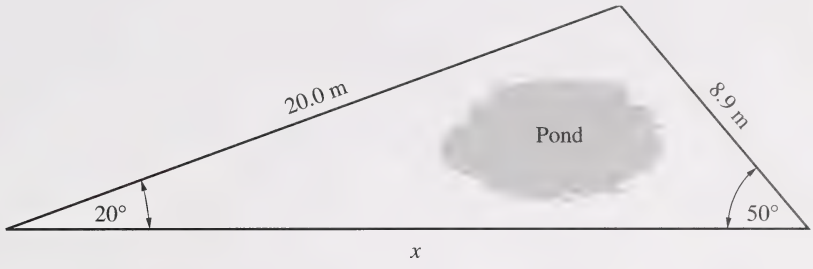
**A.** 100 m
**B.** 20 m
**C.** 5 m
**D.** 2 m

**33.** The time that the ball will take to reach the ground after being struck is

**A.** 10 s
**B.** 5 s
**C.** 4 s
**D.** 2 s

*Use the following information to answer the next question.*

A golf course designer needed to find the length of the missing side, $x$, of a triangular walking path around a pond, as shown below.




**34.** An equation that could be used to solve for the length of side $x$, in metres, is

**A.** $x = \dfrac{20.0 \sin 110°}{\sin 50°}$

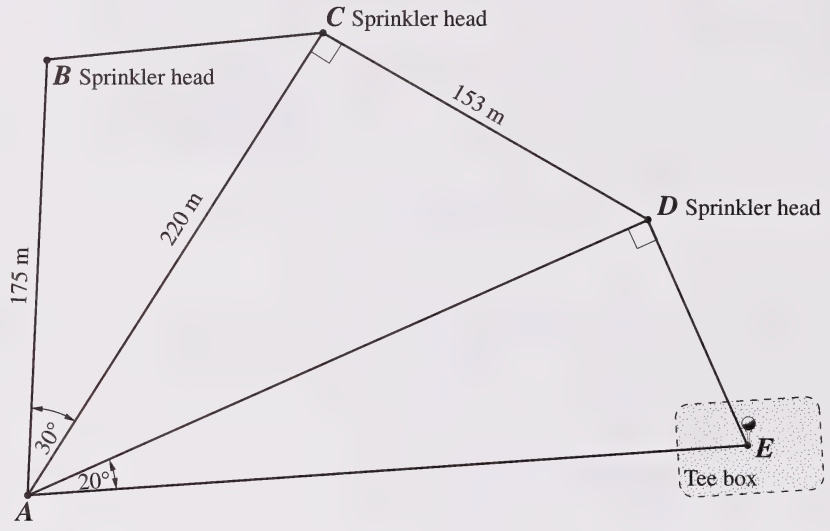
**B.** $x = \dfrac{8.9 \sin 110°}{\sin 50°}$

**C.** $x = \dfrac{20.0 \sin 50°}{\sin 20°}$

**D.** $x = \dfrac{8.9 \sin 50°}{\sin 20°}$

*Use the following information to answer the next two questions.*

To estimate the amount of new water pipe required for part of a golf course, a greenskeeper used the diagram that is shown below with some measurements already on it.




**35.** Using the values given on the diagram, the greenskeeper then determined that the distance, to the nearest metre, from the sprinkler head at point $B$ to the sprinkler head at point $C$, is

**A.** 101 m
**B.** 111 m
**C.** 133 m
**D.** 152 m

**Numerical Response**

**12.** The distance from point $A$ to point $E$, to the nearest metre, is _____ m. (Record your answer on the answer sheet.)

*Use the following information to answer the next question.*

The company supplying new water pipes to the golf course used two delivery routes. The distance to the golf course using route A or route B is 160 kilometres. The delivery truck made the initial trip on route A and then made the return trip on route B in 0.4 h less time travelling 20 km/h faster. An equation that correctly represents time, distance, and speed and that uses $x$ as a variable is

$$\frac{160}{x} - \frac{160}{x+20} = 0.4, \text{ where } x \neq 0 \text{ or } -20.$$

**36.** In this equation, $x$ represents the

**A.** travel time to the golf course on route A
**B.** return time from the golf course on route B
**C.** travel speed to the golf course on route A
**D.** return speed from the golf course on route B

---

*Use the following information to answer the next question.*

While constructing a new waterline, a greenskeeper wrote measurements in both metric and imperial units. The measured lengths of four pipes are recorded below. In the table, $I$ represents the pipe length in inches and $M$ represents the pipe length in centimetres.

| Pipe | $I$ (in) | $M$ (cm) |
|---|---|---|
| Pipe 1 | 85 | 215.90 |
| Pipe 2 | 102 | 259.08 |
| Pipe 3 | 136 | 345.44 |
| Pipe 4 | 152 | 386.08 |

**37.** The relationship between $I$ and $M$ in the table above is **best** represented by a function that is

**A.** linear
**B.** quadratic
**C.** reciprocal
**D.** exponential

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